

207-52
7-10

**VARIOUS EMBODIMENTS OF THE NON-INVASIVE
ENDOSCOPIC FEEDBACK FOR LEARNING OF
VOLUNTARY CONTROL OF
PHYSIOLOGICAL FUNCTIONING**

**Student
Mina D. Henriksen**

**Mentor
Dr. Alan T. Pope**

**Research and Technology Group
Flight Dynamics and Control Division
Crew / Vehicle Integration Branch**

ABSTRACT

The research performed was a small portion of the patent to be submitted by Dr. Alan T. Pope entitled "A Method of Providing Veridical Non-Invasive Endoscopic Feedback for Learning of Voluntary Control of Physiological Functioning." The focus of this study is to incorporate the emerging technology of virtual reality with the forms of biofeedback already in existence producing a life-like, real-time model of the body's functioning without using invasive procedures, yet still producing the equivalent of a picture from an invasive endoscopic procedure in the region of interest. The portion of the project designated to me was to research and report as many possible uses for such technology as possible.

INTRODUCTION & BACKGROUND INFORMATION:

The Virtual Reality Feedback System is designed to help individuals suffering from a wide range of ailments to improve their condition with very little pharmacological intervention, if any. Biofeedback represents an alternative to Western Medicine in that it relies on the healing power of the mind and self rather than outside intervention.

One of the advantages of feedback training over its pharmacological counterpart is that the results of the biofeedback training appear to continue even once the training has stopped, whereas pharmacological treatments tend to work only as long as they are administered. The other benefit of feedback training is that it acts externally and cannot, therefore, cause adverse internal effects, such as those experienced by many people using pharmacological treatment.

As stated in the patent application, "the invention is a method of transforming and displaying physiological information obtained from skin surface sensors in such a way as to accurately represent the functioning of the underlying physiological sources in both action and appearance. The display of the physiological information is intended to be what would be seen in real-time from the vantage point of an invasive endoscope positioned near the physiological sources and capable of dynamically changing the viewing perspective. The result is an immersive (virtual reality) display environment for training of voluntary physiological function control (biofeedback training)."

The advantage of such a system cannot be determined until a prototype has been produced and subjects responses tested and analyzed; however, it is possible that by being able to both view and understand biofeedback through a glimpse into the body's actual systems, biofeedback results will be more intense and produce better results than biofeedback training as it exists at present.

SUMMARY OF STUDY OR RESEARCH PROJECT

APPROACH:

In order to tackle the large amount of information available on the subject of biofeedback and to discern which physiological functions would be appropriate for use in a virtual reality setting, the majority of my time at NASA was spent reading and researching a myriad of ailments common in our culture, especially those which had been treated successfully through non-Western modes of treatment. Once I had researched as much as my time here would permit, I began a report to Dr. Pope on which physiological functions and ailments could be aided by the use of virtual reality feedback. My final report will be turned over to Dr. Pope who will choose which portions to add to the original patent.

LaRC EQUIPMENT AND FACILITIES:

Unfortunately, due to the nature of my research, my only exposure to LaRC facilities consisted of the Technical Library, the Macintosh computer I used to type up my findings, and Netscape. The only other resource I had access to was the knowledge of the Human Engineering Methods Group with whom I worked. Their knowledge was indispensable during my research.

RESULTS / CONCLUSION:

The result of my research is that Dr. Pope will now have more examples of uses for the system described in his patent application. I'm afraid I cannot go in to detail concerning these applications since the patent has not yet been approved. After Dr. Pope finishes with any and all changes to the patent, it will be turned in to the patent office at NASA and from there will be sent to the United States Department of Commerce Patent and Trademarks Office for approval.

